maintained. Thus, threshold loading is viewed as either providing a load or not. This is in fact an inaccurate oversimplification. One needs to consider the phases leading up to and following flow generation. In terms of threshold loading, pressure generation is continuous. Upon initiation of an inspiratory effort, against a threshold load, the negative pressure generated at the mouth rises continuously until such a point where the threshold load is realised. At this point flow is initiated, and will remain until such a point whereby pressure generation falls below the threshold load. Thus, the model that actually describes threshold loading in terms of pressure is more complex, but also more realistic, than the flow based representation.

The pressure model outlined raises the issue of potential variability in pre- and post-threshold pressure. Fortunately, the functional relevance of this potentially confounding factor is minimal. The near isometric phase of muscle contraction occurring prior to opening of the poppet valve is typically abrupt. The pressure profile increases rapidly in near linear fashion to the instant where the threshold pressure is reached, at which point flow is initiated. A near plateau in pressure is then observed (although some flow dependency exists) prior to the valve closing, whereby the decline in pressure generation is almost instantaneous.

If we adhere to convention and examine the pressure profile across inspiration, as designated by the flow generation phase, then the pressure profile is indeed threshold in nature. Threshold loading, theoretically at least, is flow independent. This is crucial – the fact that during the active phase of inspiration pressure generation is almost independent of flow makes threshold loading appealing. It is this characteristic which permits the training load to be standardised.

Thus far, the description of threshold loading has been largely conceptual. The fact that the pressure profile generated by threshold loading is not truly flow independent requires further clarification. During threshold loading, the additional resistance to inspiration observed post-threshold occurs from two sources:

- the positive force acting on the inspiratory valve (the magnitude of this force is directly proportional to the extent of additional compression within the spring, as the valve is lifted off its seat);
- flow resistance generated as air passes through the inspiratory valve (the magnitude of this force is indirectly proportional to the area available for the air to pass through).

In light of the above, it can be seen that the additional load experienced by the user, once the threshold pressure has been overcome, is the aggregate of both these forces. As the valve starts to open the increase in force generated by the increased compression of the spring is minimal, whilst the flow resistive force is maximal. As the valve is lifted further off its seat, the additional force incurred due to the increased compression of the spring becomes enhanced. At the same time, because the area through which the air can pass has now increased, the flow resistive force decreases. Thus, mechanically achieved pressure threshold loading can never be flow independent; the physical opening of the valve does not permit this. However, variations in flow during the pressure plateau phase usually have little impact upon the pressure profile observed. It should be noted that this is not the case, when high flows are generated against relatively low loads, in this instance marked increases in load can be observed (refer to Fig. 3).

Figures 3 and 4, illustrate the effect of flow rate upon pressure profile using the present device at two discrete load settings. Flow rate was measured using an ultrasonic phase-shift flow meter whilst pressure was recorded using an electronic pressure manometer. Under both conditions a large syringe was used to draw 3 L of air through the device; conditions of low, medium and high flow were examined (numerically depicted as 1, 2 and 3, respectively, in the figure). A syringe was used to standardise flow/pressure profiles which is problematic *in vivo*. However, it was used in a manner which simulated forced inspiration, thus the data generated are physiologically relevant. The least physiologically relevant phase occurs post flow cessation, whereby a gradual decrease, in pressure